Richmond Refinery LPS Reliability Bulletin

RLOP F-1550 Furnace Elbow Leak and Fire

IMPACT ERM:
Loss# 23111 Inv# 14914

Location:
Hydroprocessing Division,
RLOP, HNC Plant

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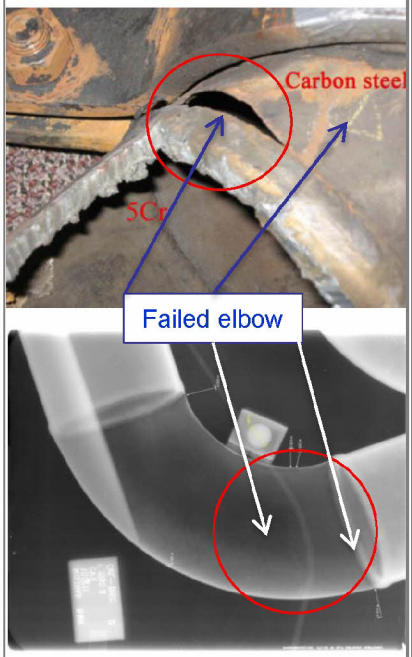
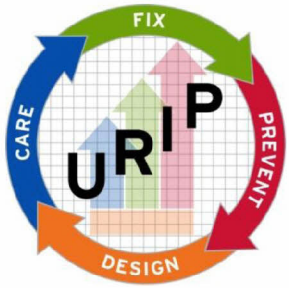


Carbon steel elbow in 5Cr Furnace Coil



IIF -- Every Task, The Right Way, Every Time

Incident Description:

On Monday, 10/03/2011, at 2:53am, the RLOP Heavy Neutral Cracker (HNC) F-1550 developed a furnace tube leak about two hours after pulling feed at 12:30am as part of the scheduled RLOP 4th Quarter Turnaround Event. Feed to the LNC (Light Neutral Cracker) unit was pulled a day earlier than planned. Operations drained and cleaned the furnace for inspection, which revealed the 5" bottom elbow at Pass-D had corroded. A PMI (Positive Material Identification) exam determined it was made of carbon steel rather than the required 5-Cr alloy. A PMI inspection did not yield any other incorrect materials in F-1550. In addition to replacing the corroded elbow, a few of the 5-Cr furnace tubes and fittings were replaced in all four furnace passes to achieve an acceptable 10-year furnace coil remaining life.

Investigation Findings:

1) The Retroactive PMI program did not include refinery furnace inspections. Prior thickness data was consistent with 5-Cr alloy.
2) Past inspections did not provide any insight with respect to a potential high corrosion rate as HNC unit feed rates were increased since 2009 and the most recent inspection was in 2007.

What Worked Well:

1) Operators invoked their Stop Work Authority by immediately blocking fuel to burners. They isolated the leak by aborting the furnace diesel flush and reactor hot strip.

Lessons Learned:

1) While sulfur concentration, pressure, and temperature have not changed in a decade, the rate of sulfidation corrosion for this carbon steel elbow increased and resulted in this failure.
2) The damage could have been much worse if the elbow had failed prior to pulling feed for the shut down.

Recommendations:

1) Update the Retroactive PMI procedure to include all furnaces.
2) Update inspection plans to perform a one-time retroactive PMI inspection (at the next inspection activity) on all alloy furnaces (in the Richmond refinery) where similar PMI inspection data has not already been fully documented.

Tenets of Operations Violated:

#1-Always operate within design and environmental limits
#6-Always maintain integrity of dedicated systems